STATE OF LOUISIANA
COASTAL IMPACT ASSISTANCE PLAN

DESIGNATED STATE AGENCY OR COASTAL POLICAL SUBDIVISION:
Louisiana Parishes: Lafourche, Orleans, St. Mary, Terrebonne (these are the major ones)

PROJECT TITLE:
Accelerating the Development of the Coastal Infrastructure in Southern Louisiana:
The Environmental Technology Collaboration Program

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PROJECT SUMMARY
Location: The project is designed to involve the offshore and maritime infrastructure located in Southern Louisiana
Duration: Project support is requested for four years
Total Estimated Cost: $10,000,000
Funding Request by Year: Request of $2,500,000 per year

BRIEF SUMMARY

Accelerating the Development of the Coastal Infrastructure in Southern Louisiana

The Environmental Technology Collaboration Program

A significant part of the economic future of the Bayou Region is dependent on the technological and entrepreneurial innovations of its inhabitants. Those skills will determine the wealth-creation potential of the region, the quality of the jobs available, and the ability of well-educated young people to form satisfying careers at home. An effort to shore up skills of today's college students is being done against the backdrop of a changing methodology for creating value from research is being altered. A value chain links intellectual assets all the way from initial research and development to a final product. The end product must create economic value for the company that introduces it.

A corresponding change is from vertical to horizontal industry structures. Vertical industry structures (in-house) have given way to horizontal industry structures. Vertical integration, where a single company would conceive, design, manufacture and deliver the product as well as support its customers, has evolved to an open innovation environment. In-house basic research is diminishing as a consequence of free flow of ideas, people and products. In the open-innovation model, success is increasingly based on teamwork, networking and contributing to the activities of others. Industry research relies now on contacts between all researchers, from industry to government to universities and others.

The South Louisiana Economic Council (SLEC) enables companies associated with the energy, offshore and maritime industries to network and collaborate. SLEC provides the platform for companies to discover and learn about business opportunities. The Coastal Impact Assistance Program (CIAP) implements, supports and accelerates coastal infrastructure projects that directly benefit Outer Continental Shelf (OCS) activities and mitigates onshore OCS-related impacts. Nicholls State University has been working with the Houston Advanced Research Center (HARC) to implement the Shared Technology Transfer Program (STTP) aimed at identifying and transferring technology from NAVSEA-Carderock to the offshore and maritime industries.

Blue Water Technology Program

The Blue Water Technology Program was created in response to the growing demand for new, environmentally intelligent technology for the offshore and maritime industry. It was established by the Houston Advanced Research Center (HARC), a not-for-profit research organization in Houston, Texas. Created in 1982, HARC is a non-partisan research organization ***dedicated to moving knowledge to action to improve human well-being and the environment***. HARC acts as the Program manager and maintains responsibility for all matters relating to program operations.

HARC is collaborating with NAVSEA-Carderock and Nicholls State University. ***NAVSEA-Carderock is a 3,000 person research organization chartered by Congress to support the domestic maritime industry.*** NAVSEA-Carderock is responsible for the research and development, testing and evaluation, in-service engineering, logistics, and fleet support of Navy surface and undersea vehicles.

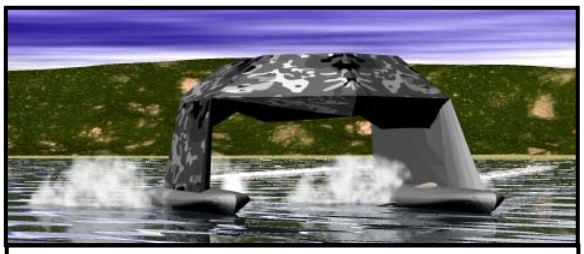
Nicholls State University, SLEC and HARC propose a new program, ***the Environmental Technology Collaboration Program (ETCP)***, dedicated to accelerating the development, redevelopment and expansion of the coastal infrastructure of Southern Louisiana. ***The ETCP will build upon the successful Blue Water***

Technology Program and the STTP to focus on issues within Southern Louisiana while providing economic growth and will include three key activities:

- Review technologies and map to industry needs
- Assess and develop technology transfer/demonstration plans
- Implement and facilitate technology transfer and demonstration

The US Department of Energy has provided previous funding to enable Nicholls State University and HARC to develop a technology catalog that includes over 600 patents from NAVSEA-Carderock.

The Blue Water Technology Program has facilitated transfer of technologies from NAVSEA-Carderock to the offshore industry.



NAVSEA-Carderock PHAST Design Concept

Demonstration of Oil/Water Separator Technology at Port of New Orleans

Existing shipboard oil/water separator systems cannot always reduce oil concentrations to levels low enough for overboard discharge, causing recirculation and effectively reducing processing rate. Ultrafiltration membranes provide physical separation of oil. The Port of New Orleans is interested in demonstrating the use of advanced membrane filtration systems on their dredge. This project could demonstrate the use of technology to reduce the environmental impact of marine operations within the port.

Membrane Filtration System

The overarching goal of the ETCP is to establish a collaborative process with Southern Louisiana industries for the purpose of sharing government-developed technology in order to accelerate projects and economic development that benefit OCS activities while mitigating environmental impacts. The purpose will be to educate private sector businesses to increase their awareness of the vast amount of technologies that are available, with an initial focus on technologies from NAVSEA-Carderock. Based on success with NAVSEA-Carderock technologies, technologies from other laboratories will be mined for application to the offshore and maritime industries.

An annual budget of $2,500,000 is requested for each of the four years of the program. This budget includes $754,000 to be used for planning activities and technology outreach programs including mapping of industry needs and identifying appropriate technologies. The remaining budget will be for technology transfer projects including demonstration projects and development of prototype applications.

The ETCP has many benefits, including:

- Advancement of technologies that will directly benefit OCS oil and gas production and will mitigate environmental impacts

- Mitigated risk and reduced cost by taking advantage of mature technologies developed by the Navy with taxpayer support
- Strengthened national energy security, domestic supply, and infrastructure stability

AUTHORIZED USES

The proposed program addresses three of the Authorized Uses within the Coastal Impact Assistance Program:

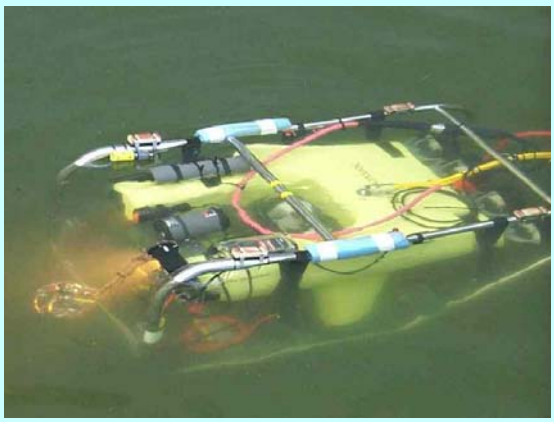
Authorized Use 1: ***Projects and activities for the conservation, protection or restoration of coastal areas, including wetland***
Authorized Use 2: ***Mitigation of damage to fish, wildlife, or natural resources***
Authorized Use 5: ***Mitigation of the impact of OCS activities through funding of onshore infrastructure projects and public service needs.***

The Environmental Technology Collaboration Program (ETCP) builds upon the successful collaboration that Nicholls State University, the Houston Advanced Research Center (HARC) and NAVSEA-Carderock have constructed since 2003. The ETCP will focus on improving the economic development of Southern Louisiana while addressing the three Authorized Uses listed above.

Discussions have already been held with the Port of New Orleans to ensure that organizations within Southern Louisiana are interested in cooperating with the program.

One area of interest, for example, is the Navy environmental technologies that Nicholls State University and HARC have identified as potential applications to the Southern Louisiana infrastructure. NAVSEA-Carderock's Environmental Quality Department is recognized as a Center of Excellence in Environmental Technology for Navy ships and Navy shore commands. The Department's Pollution Prevention and Material Safety Branch, Code 632, provides the Fleet with innovative pollution prevention technologies that enable Navy ships to operate and train worldwide with minimal impact on the environment. These technologies include materials, processes and equipment that reduce pollution at the source, and provide for the recycle, reuse and disposal of hazardous materials and wastes in the most environmentally acceptable manner. The Branch's efforts extend to the development and improvement of ship repair, maintenance and deactivation processes performed both pier-side and in the shipyard environment.

Underwater Hull Husbandry



The U.S. Navy is working on extending the time between drydocking from the current 5-7 years to 12+ years. This requires quality assurance inspection during paint application, periodic underwater evaluations with a new, tethered, free swimming Remotely Operated Vehicle (ROV), and the ability to conduct underwater maintenance. ***In addition to reducing the impact on the environment, the use of the underwater hull husbandry robot to extend the dry-dock cycle saves $8-14 million per ship.*** The technology has direct application to industry and can mitigate damage to fish, wildlife and natural resources.

A NAVSEA-Carderock pollution prevention program identified by Nicholls State University and HARC having direct application concerns oil/water separation technology related to removing bulk oil sludge that degrades separator performance. The process developed by NAVSEA-Carderock ***can remove approximately 68% of bulk oil and sludge without having to open the oil/water separator lid, resulting in 50% less liquid waste and the creation of no oil-contaminated solid waste***. The Port of New Orleans has expressed interest in applying this technology within their operations.

The majority of the CIAP funding will be used to support the design, development, testing and demonstration of prototypes applicable for industry applications that are based on technologies developed by NAVSEA-Carderock. Cost-sharing from industry partners will be used to complement the CIAP funding. The industry cost-share will ensure that the for-profit partners have an interest in commercializing the technologies.

PROJECT DESCRIPTION

Accelerating the Development of the Coastal Infrastructure in Southern Louisiana

The Environmental Technology Collaboration Program

INTRODUCTION

Nicholls State University proposes to team with the Houston Advanced Research Center (HARC) to expand their program concerning the application of government developed technologies to the offshore and maritime industries to industries in Southern Louisiana. Nicholls State University and HARC will team with the South Louisiana Economic Council (SLEC) to assess industry needs, identify applicable technologies and establish meaningful technology transfer projects to enhance economic development in Southern Louisiana while mitigating the impact of Outer Continental Shelf (OCS) activities. The proposed program, the Environmental Technology Collaboration Program (ETCP) will focus on technologies that will conserve, protect or restore coastal areas while mitigating damage to fish, wildlife or natural resources.

The overarching goal of the ETCP is to establish a collaborative process with Southern Louisiana industries for the purpose of sharing government-developed technology in order to accelerate projects and economic development that benefit OCS activities while mitigating environmental impacts. The purpose will be to educate private sector businesses to increase their awareness of the vast amount of technologies that are available, with an initial focus on technologies from NAVSEA-Carderock. Based on success with NAVSEA-Carderock technologies, the possibility of mining technologies from other government laboratories will be explored for application to the offshore and maritime industries.

Nicholls State University
South Louisiana Economic Council

- ***Nicholls State***: introduces new technology to students and local businesses and provides hands-on experiences for students and local work force.
- ***SLEC***: provides network of businesses that can implement technologies to reduce environmental impacts.

Houston Advanced Research Center
NAVSEA-Carderock

- ***HARC***: nonprofit, non-partisan organization dedicated to moving knowledge to action to improve human well being and the environment.
- ***NAVSEA-Carderock***: a 3,000 person research organization chartered by Congress to support domestic maritime industry.

IDENTIFICATION AND SIGNIFICANCE OF THE PROBLEM

The energy and maritime companies of today will be the energy and maritime companies of tomorrow. In the past two decades, however, the methodology for creating value from research knowledge has been fundamentally altered. A value chain links intellectual assets all the way from initial research and development to a final product or service. The end product must create economic value for the company that introduces it. Vertical industry structures have given way

to horizontal industry structures. Vertical integration, where a single company would conceive, design, manufacture and deliver the product as well as support its customers, has evolved to an open innovation environment. In-house basic research is dying out as a consequence of free flow of ideas, people and products. In the open-innovation model, success is increasingly based on teamwork, networking and contributing to the activities of others. Industry research relies now on contacts between all researchers, from industry to government to universities and others.

Discussions have been held with the Port of New Orleans and various businesses to develop an understanding of the need for new technologies that can address environmental issues. For example, the Port of New Orleans has stated a need to improve the filtration of bilge and oily wastes to increase the cleanliness of discharges in order to mitigate damage to fish, wildlife and natural resources. Various businesses have expressed the need for technologies that can protect the environment and provide economic development to the area.

BACKGROUND

The South Louisiana Economic Council (SLEC) enables companies associated with the energy, offshore and maritime industries to network and collaborate. SLEC provides the platform for companies to discover and learn about business opportunities. The Coast Impact Assistance Program (CIAP) implements, supports and accelerates coastal infrastructure projects that directly benefit Outer Continental Shelf (OCS) activities and mitigates onshore OCS-related impacts. Nicholls State University has been working with the Houston Advanced Research Center (HARC) to implement the Shared Technology Transfer Program (STTP) aimed at identifying and transferring technology from NAVSEA-Carderock to the offshore and maritime industries.

The STTP was created in response to the growing demand for new, environmentally intelligent technology for the offshore and maritime industry. The current program has identified potential technologies for transfer and demonstration, based on Navy technology that is applicable to the needs of the offshore, energy and maritime industries. Core activities encompass:

- Reviewing and cataloging available NAVSEA-Carderock technologies
- Mapping industry needs to the technologies
- Assessing technology transfer and demonstration plans
- Facilitating the effective technology transfer and demonstration of identified technologies
- Serving as a clearinghouse for information and education about the Program/ providing useful industry contacts throughout the entire supply chain.

The U.S. Department of Energy – Office of Fossil Energy funded an initial project that outlined a web based technology catalog providing information about technical resources. An industry consortium, the Blue Water Technology Program, has helped to set priorities. Recognizing the transition to hydrogen, the Department of Energy funded the STTP to educate the industry. With CIAP funding, the ETCP will reach a broader audience and address the significant need that has been identified for environmental technologies in Southern Louisiana.

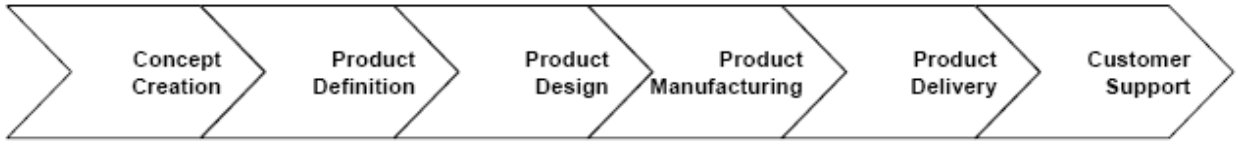
Part of NAVSEA-Carderock's mission is to cooperate and collaborate with the U.S. maritime industry wherever practical. The Administration, the U.S. Congress, and the Navy are putting

greater emphasis on transferring Navy-developed technology to U.S. industry to increase industrial competitiveness, to create jobs, and to create capital investment opportunities. Emphasis is being placed on both transfer of technology for mission application with industry and for dual-use applications with industry. The Technology Innovation Act authorizes the Navy to work with industry to conduct mutually beneficial R&D.

"Venture capitalists and potential customers wait until a technology has proven itself in the demonstration – usually after the product has become established in the marketplace – before making an investment or purchase. If a technology developer is unable to survive the demonstration phase, all of the funding up to this point is wasted."

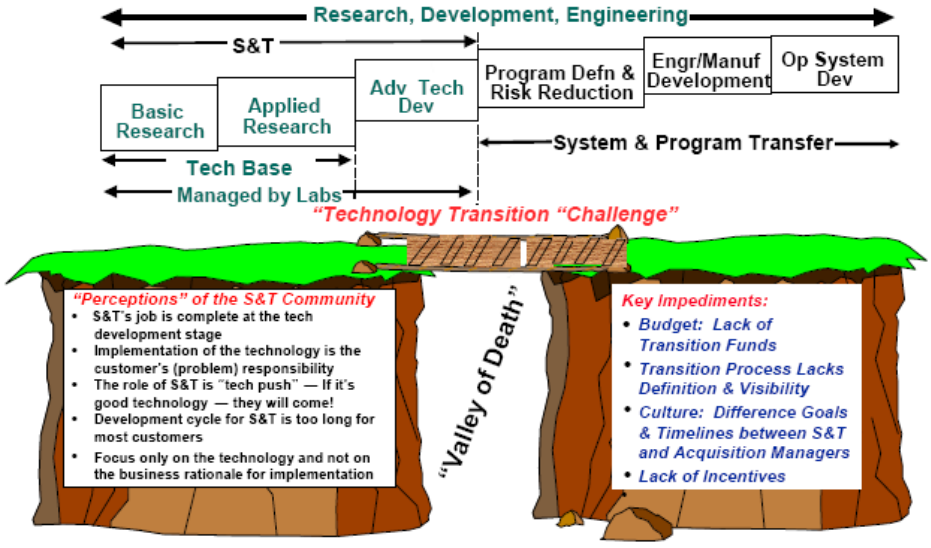
"Bridging the Valley of Death: Financing Technology for a Sustainable Future", a report prepared by the U.S. Small Business Administration for the U.S. Environmental Protection Agency (Interagency Agreement #DW73936877-01), December 1994

Other government laboratories, for example the U.S. Department of Energy's Oak Ridge National Laboratory, develop technology that may also be applicable to industry applications in order to mitigate environmental impacts. The push to open innovation, wherein industry is relying more and more on networking and outside research to generate new ideas, has increased the need for programs that can seek out technologies in a non-partisan manner. The road to commercialization relies on the value chain, linking intellectual assets from research and development to a final product or service.



The Research, Development, Engineering and Commercialization Value Chain

The ETCP will address the need to accelerate the transfer of technologies, decreasing the time it takes from concept creation to product delivery. In the transition from concept creation to product delivery and beyond, there is a series of critical tasks that must be focused on in order to bridge the entire value chain. The ETCP will support environmental related technologies at the stages where well-conceived concepts often fail due to lack of resources for essential testing, evaluation, prototype development and demonstration activities. The information gathered in these stages is essential to the real-world validation, redesign and scaling required before final commercialization.



The ETCP will focus on bridging the gap.

TECHNICAL APPROACH

Goals and Objectives

The overarching goal of the ETCP is to establish a collaborative process with Southern Louisiana industries for the purpose of sharing government-development technologies, in particular those related to mitigating environmental impact, in order to accelerate projects and economic development. There are two elements to the ETCP, a technology outreach element dedicated to identifying suitable environmental technologies for transfer, and a technology transfer element.

Detailed Objectives/Tasks

TECHNOLOGY OUTREACH ELEMENT

1. Assess needs of the energy and maritime industries in Southern Louisiana, focusing on technology needs related to mitigating environmental impact.
    - Maintain liaison with various industry networks and with individual businesses
    - Hold workshops and other outreach activities
2. Review NAVSEA-Carderock Unclassified Technologies with a focus on identifying those technologies that relate to needs identified
    - Maintain liaison with NAVSEA-Carderock
    - Review NAVSEA-Carderock Unclassified Technologies – prepare briefings of technologies for communicating with business network
3. Identify other government laboratories that have applicable environmental technology development programs underway
    - Maintain liaison with U.S. Environmental Protection Agency Research and Development organization, various U.S. Department of Energy laboratories
    - Review available technologies – prepare briefings for business network
4. Develop and implement an Educational Outreach program to increase awareness of environmental technologies available for transfer
    - Maintain liaison and coordinate potential industry sponsors
    - Develop and implement plan to inform industry
    - Hold stakeholders' meetings to solicit guidance for the program and to present case studies, program results and program plans
5. Identify and match businesses that might benefit from the technologies
    - Identify and match companies that might benefit – meet with companies
    - Assist industry with transfer of technologies
    - Prepare plans to develop case studies w/industry for evaluation of transfer
    - Perform case study
6. Reporting and Briefings
    - Maintain liaison and coordination with Costal Impact Assistance Program
    - Document results through case studies and an annual report
    - Attend appropriate meetings/conferences

TECHNOLOGY TRANSFER ELEMENT

7. Develop Prototype Program
    - Develop assistance projects for the transfer of technologies identified
    - Oversee projects to design, develop, install, test and monitor prototypes

- Organize tours of installed prototypes to educate other companies/organizations on available technologies that can reduce environmental impacts

One aspect will be to study which plant will be most effective in stabilizing Louisiana's salt marsh areas.

Woody Plants for Coastal Restoration

With the recent accelerated destruction of Louisiana's wetlands due to hurricanes Katrina and Rita, there is a dire need for the acquisition of plant materials suitable for transplanting in our sensitive coastal areas. At the same time, the region is threatened by very serious coastal erosion problems. Even before hurricanes Katrina and Rita hit in 2005, the bayou coast was vanishing at a rate that exposed more and more human dwellings and worksites to the furies of the gulf weather systems. Even the large city of New Orleans is threatened by direct impacts from storm surges as its buffering wetlands disappear. The problems are widely recognized, especially after the 2005 hurricane impacts.

The NRCS Plant Material Program in Golden Meadow has developed a variety of Spartina alterniflora (Vermilion smooth cord grass) to assist in the prevention of shoreline erosion and to stabilize banks, levees, terraces, and restoration projects.

Dr. Alex Lasseigne, Plant Taxonomist, Department of Biological Sciences, Nicholls State University, proposes to examine woody species potentially useful in wetland stabilization. Due to its high salt tolerance, black mangrove is the premier woody species used in stabilizing Louisiana's salt marsh areas. One of the problems that has been noted is black mangrove's lack of cold hardiness. During harsh winters, there will be a massive die-back, from which it will then take several growing seasons to recover. Dr. Lasseigne proposes to do an extensive literature and herbarium search (both in state and out-of-state herbaria) in order to identify the potentially more useful ecotypes of black mangrove and other woody plants (ex., wax-myrtle, etc.) potentially useful in wetland stabilization. He will then collect propagules of these plants during their proper seasons from their natural environments. These will then be subjected to varying environmental conditions (ex., temperature, salt concentration, etc.) in greenhouses in order to ascertain those ecotypes most suitable to Louisiana's coastal conditions. It is envisioned that the background studies and propagule collecting can occur during the first year of the grant, while monitoring of the young plants under varying conditions will take several subsequent years.

The NRCS Plant Material Program is also planning to grow mass plantings for distribution, (at Nicholls State University) of woody species useful in marsh restoration, but it is my understanding that they do not intend to subject these to varying environmental conditions (ex., temperature, salt concentration, etc.). Our project will identify potentially more useful ecotypes for Louisiana's coastal conditions. These can then be offered to the NRCS Program for mass planting, or developed independently.

In addition to technological improvements, this programs seeks to train and retain our engineering graduates. Later in the course of this program, we expect to support additional projects that expand the emerging Louisiana expertise into global markets. As we solve our own

problems in Louisiana, we will develop environmental expertise and technologies that are valuable in other locations in the USA and other countries. Developing that export capability will further ensure the health of high quality companies and jobs in the Bayou region.
One of the exports we now have and regret is the export of talented young people. People who have grown up in the region, who love and understand its environment, are far too often moving away to pursue their careers elsewhere – even when they'd rather stay and contribute here.

As a recent report to the South Central Industrial Association demonstrated, the region and the state are not currently generating the kinds of jobs that will make use of the talents and energies of these young people. This proposal is part of a solution to that problem. By developing industries that require state-of-the-art research, technology, and business skills, we will create great jobs for hundreds of well-educated young people. By supporting internships and practical experience for eager students, it will make them part of the solution.

Nicholls State University launched its Entrepreneurship Concentration in 2005. For undergraduates, the Concentration consists of a foundational course (MNGT 305), available to all students with Junior standing. That course is followed by a New Product Development and Marketing course (MKTG 480), and an Entrepreneurial Finance course (FINC 435). The capstone course (MNGT 485*) is called New Venture Creation, and it allows each student to spend an entire semester working out the details of a new business plan. MBA candidates have a different foundation course available to them (BSAD 525), and also have access to the capstone Business Planning course (MNGT 485*).

While Nicholls does not have a full engineering program, it does have several programs that attract technologically adept students. Within the College of Business, the Computer Information Systems program has many students with strengths in software, databases, website design, etc. In fact, this Department contributed the core group that formed the STTP teams that served as our prototype E-Team in 2006.

- The Manufacturing Technology program has strengths in design, prototype, and factory assessment. The Computer Science program in the Faculty of Arts & Sciences has students with programming strengths, and the development of computerized games, simulations, and training programs.
- The Environmental Studies programs in the Dept. of Biology have a growing cadre of very strong students with expertise in ecology and various biological disciplines, many of them focused on coastal impact issues. The Biology programs closest to this program in content are: Environmental Biology; Marine Biology; Environmental Agriculture; and Agricultural Business – although there are potential contributors in many parts of this outstanding Department.
- The Shared Technology Transfer Program, precursor to the present proposal, allowed the university to experiment with various kinds of programs, including the development of multidisciplinary teams. While not all of the bureaucratic obstacles have been cleared, many of the pedagogical ones are being addressed.

We have learned from existing programs, like the NCIIA's E-Teams program and the N2Tech inter-university consortium, some of the better ways to assemble, teach, and motivate students toward productive business and technology solutions to important problems. What we are proposing here goes further in some respects, because it focuses on environmental solutions,

rather than software, manufacturing, or medical technologies. Yet, this proposal is that we make use of those skills, adapting them to applications that address coastal environmental impacts. We plan to use advanced knowledge of coastal ecology to fundamentally understand problems, then use a wide range of technological skills to create effective solutions, transferring those results into the economy through business and government organizations. Since we will be creating organizational and economic capacity that does not presently exist, there will be much need for entrepreneurial thinking and skill.

Internships

One of the problems facing the bayou region is that our best technological oriented students usually have to leave the region for higher education. Yet many wish to return to the region and contribute their knowledge and skill to solve important problems here. Accordingly, we propose to work with leading engineering schools in Louisiana, including LaTech, LSU, and ULL to develop internships for Louisiana engineering students who want to work on coastal projects. Using organizational techniques pioneered by the N2Tech consortium and NCIIA on a national basis, we propose using high-speed Internet pipelines to assemble and coordinate multidisciplinary teams of students across the state. Those in-term projects to research and investigate problems and solutions will be supplemented by summer and other hands-on internships in the region, working with industry teams.

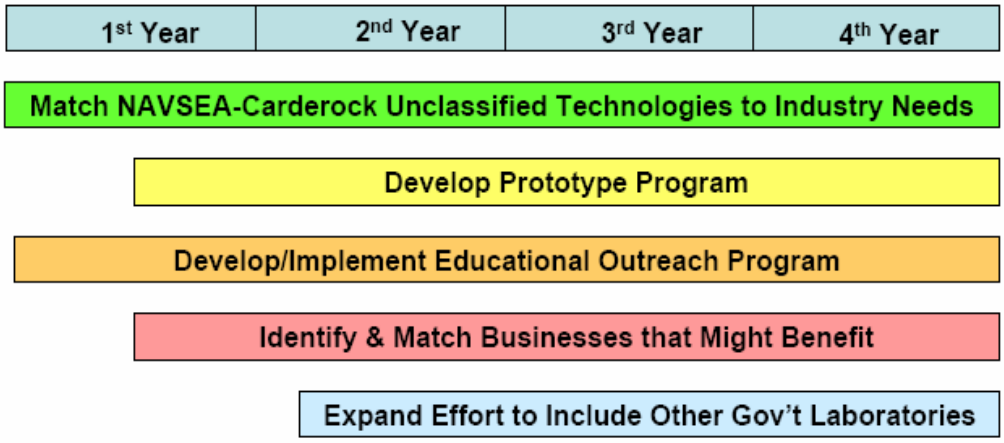
Technical Colleges

We are fortunate in this region to have an established and growing network of effective technical colleges, including: Young Memorial (St. Mary's); Lafourche; and Fletcher (Terrebonne). These schools have established post-secondary and adult programs in technical skills and trades. We propose working closely with them, especially in the propagation and implementation phases of the projects. As prototype technologies are developed by the university-industry teams, we expect plans to be developed and implemented for widespread propagation and manufacturing, as well as use and maintenance of machinery and organizational systems. The skills necessary for successful operation are the kinds of things the technical colleges develop and transfer well, and we will need to involve them to make this program successful in the long run.

Related orgainziation Nicholls State University can draw upon are the National Collegiate Inventors and Innovators Alliance was established by the Lemelson Foundation. Jerome Lemelson was one of the most prolific American inventors of all time, and he created his foundation and the NCIIA to encourage furthr development of American invention. The NCIIA supports the development of new programs, and of the operation of E-Teams. A second is the N2Tech consortium has been funded by the National Science Foundation and the Lemelson Foundation to find ways of creating effective cross-disciplinary multi-institution students teams in the fields of technology development and commercialization. It is directed by Prof. Kathleen Allen, at the University of Southern California.

Schedule and Deliverables

The ETCP will build upon the success of other programs. As a result, there will be minimal upfront work to initiate the program. Meetings with industry and others will begin as soon as possible to discuss the ETCP and to initiate the identification of environmental technology needs.



ORGANIZATIONS

Nicholls State University

Nicholls State University, located in Thibodaux, Louisiana, is a comprehensive, regional University serving south central Louisiana.

Nicholls State University has extensive research experience among its wide variety of faculty. The university has engaged in seeking and obtaining funding opportunities in multiple areas.

Nicholls is an emerging research institution. In 2003, one department alone secured funding of $1.5 million from government (USDA, NSF, NOAA, EPA, Louisiana Board of Regents, Louisiana Dept. of Natural Resources), and industry (BP Corporation). That year saw publications at 27 professional meetings, 7 chapters in books, and 12 peer-reviewed journal publications all in 2003.

The Houston Advanced Research Center (HARC)

HARC is a 501(c)3 non-profit institution located in The Woodlands, Texas. Founded in 1983, HARC has a staff of about 45 professionals. 2006 revenues will be approximately $15 million (before subcontracts to various partner institutions), projected to grow to approximately $20 million by 2008. HARC's founder is George P. Mitchell who for 30 years has been a leading advocate of sustainable development, the philosophy that seeks balance between human well-being and the preservation of the earth's natural systems for the future. George Mitchell built Mitchell Energy & Development Corporation, one of the nations largest producers of natural gas, while establishing himself as a leading philanthropist in the sustainability movement. HARC has managed environmental programs for almost twenty years, and in 2001 placed sustainable development as its core mission.

Central to HARC's mission is its positioning as a "boundary organization" situated between ***producers*** of scientific knowledge (scientists, inventors, and academics) and ***users*** of that knowledge (technology adopters, policy makers, the public). In its boundary role HARC engages with the science community by employing a staff with scientific credibility, while appealing to its sponsors by employing a business-like approach to project management and financial

accountability. HARC's business offices – including Grants & Contracts, Accounting, Personnel, and Security – are a core strength that positions the organization to excel in programs that include subcontracting and government agency audits. HARC routinely works with academic, government, private and non-profit sector institutions and is comfortable in roles that require engagement with both environment and industry advocates.

HARC's operates programs in six themes: water, energy, air & climate, ecosystems, human & environmental health, and the built environment. Its core competencies include stakeholder engagement, research management, information synthesis, technology assessment, and policy analysis. HARC's primary operating regions are the greater Houston area, the upper Texas coast, and the adjacent Gulf of Mexico.

HARC and NAVSEA-Carderock Relationship

The U.S. Navy's Naval Sea Systems Command-Carderock (NAVSEA-Carderock) Division is one of the Navy's laboratories and a center of excellence for ships and ship systems. With unique laboratories and test facilities, large-scale land-based engineering and test sites, and at-sea measurement facilities throughout the United States, NAVSEA-Carderock has been at the forefront of technologies vital to the success of the Navy and the maritime industry of the United States for more than a century.

NAVSEA-Carderock has historically invested in developing technologies for harsh environments associated with offshore operations. Both the energy industry and the Navy share many of the same technological challenges. There is strong alignment between the energy industry's current environmental technology needs and the Navy's ongoing initiatives. NAVSEA-Carderock consists of 3,800 scientists, engineers and support personnel working in more than 40 technical disciplines ranging from fundamental science to applied/in-service engineering. NAVSEA-Carderock has been awarded over 600 patents since 1980 and continues to discover new technologies and applications that keep our national maritime capabilities at the global forefront.

HARC has entered into a Memorandum of Understanding (MoU) and a Cooperative Research and Development Agreement (CRADA) with NAVSEA-Carderock. These agreements provide a business and intellectual property framework that allows technology transfer between the Navy and industry to proceed quickly and efficiently. The MoU describes the parties' commitment to collaborate for promoting the exploitation of technologies for the benefit of both the United Sates Navy and the offshore/maritime industry. The CRADA supports government and industry initiatives aimed at exploring and stewarding the natural resources found throughout the world's oceans. In accordance with the U.S. Federal Technology Transfer Act, NAVSEA-Carderock desires to make their expertise and technology available for use in the public and private sectors. HARC has the interest, resources, capabilities and technical expertise to translate the availability of Naval research for public use.

The South Louisiana Economic Council (SLEC)

Since 1984, The South Louisiana Economic Council (SLEC) has served the business of the Bayou Region parishes of Assumption, Lafourche, St. Mary and Terrebonne. Today SLEC offers a variety of new and innovative programs that can help with startup, expansion, developing international markets and more. One program offered by SLEC is the Louisiana Small Business

Development Center (LSBDC Network), whose mission is to enhance the economic well being of the citizens of Louisiana by providing comprehensive, high-quality assistance to existing and potential small businesses. The Center fosters the formation and growth of small businesses through individual counseling services, educational training programs, and business information resources to expand and diversify the Louisiana economy. The Bayou Region Small Business Development Center is located on the campus of Nicholls State University and is part of a state and national consortium of similar small business development networks. The center serves businesses in Assumption, Lafourche, St. Mary and Terrebonne parishes by providing managerial and technical assistance to small business owners. SLEC maintains a close relationship with the Small Business Development Center in order to continue to provide high-quality assistance to Bayou Region small businesses.

KEY PERSONNEL

Dr. John Griffin from Nicholls State University and Dr. Richard Haut from HARC have worked together since 2004 on the Shared Technology Transfer Program (STTP) funded by the U.S. Department of Energy.

Dr. John Griffin, Nicholls State University, Principal Investigator

Dr. Griffin has over 25 years of industry and academic experience. He has worked with and for operators, major service companies and independents. His facility with combining technical groups will aid this program.

Dr. Tom Bryant (Co-Principal Investigator)

Tom Bryant currently holds the Bollinger Family Endowed Chair in Entrepreneurship at Nicholls State. He was the first person appointed to an endowed chair in entrepreneurship in Louisiana. A committed environmentalist as well as entrepreneurship expert, he organized and chaired the first New Jersey Conference on Sustainable Business and hosted and co-chaired the Atlantic Conference on Sustainable Business. He has also served as the entrepreneurship specialist on the environmental business BEE-21 curriculum for high school students now being adopted at school systems in the USA. Over the last 20 years, he has coached many hundreds of entrepreneurs in several countries. His PhD was awarded by MIT, in 1982, in part for a dissertation on multidisciplinary management of very large water / environmental / industrial projects. He has held pioneering endowed positions in entrepreneurship at three universities, and is widely known as one of the best entrepreneurship program developers in the world. He has served as principal on more than 100 research and consulting contracts. Before coming to Nicholls, he established the High-Tech Ventures MBA program at Rutgers, and served as the Rutgers' rep in the N2Tech Consortium.

Dr. Richard C. Haut, Houston Advanced Research Center, Co-Principal Investigator

Throughout Dr. Haut's career, he has successfully led several projects of similar size, scope and complexity. Prior to leaving the energy industry and joining HARC in 2002, Dr. Haut was the first Chief Operating Officer for Enventure Global Technology, a joint venture between Halliburton and Shell that he helped to start-up in 1998. Over his tenure at Enventure, he was intimately involved in taking the technology from conception to profitability, receiving the Hart Publication's Meritorious Award for Engineering Innovation in 1999 and the Natural Gas

Innovator of the Year Award from the Department of Energy in 2002. Prior to Enventure, Dr. Haut successfully lead high-technology efforts while employed at Exxon Corporation. Dr. Haut's technical background includes a Masters degree in Aerospace Engineering and a Ph.D. in Engineering. Dr. Haut has over 25 years of industry technical/management experience prior to joining HARC in June 2002, having been responsible for analyzing offerings for key technologies or niche capabilities and developing synergistic, strategic relationships in the oil and gas industry. He has authored numerous papers, has been awarded various patents and has several patents pending.

PROJECT MANAGEMENT

Management Plan

Nicholls State University will be the prime contractor for this effort. As prime contractor, Nicholls State University will be responsible for the total effort including technical performance, meeting schedules and delivery of quality products within the established funding restrictions.

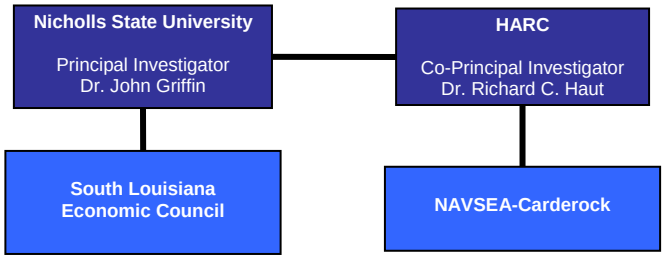
HARC will act as a subcontractor to Nicholls State University and will provide technical direction for the project. In addition, HARC will act as the liaison to NAVSEA-Carderock and other government laboratories for all tasks assigned to NAVSEA-Carderock or other laboratories.

NAVSEA-Carderock will be subcontracted by HARC and HARC will oversee NAVSEA-Carderock's involvement in the project.

The South Louisiana Economic Council (SLEC) will be subcontracted by Nicholls State University. SLEC will be responsible for activities related to various workshops, networking with businesses and consulting with businesses to transfer the technologies. SLEC will work with the businesses to ensure that the technologies are properly incorporated into their core business plans.

Organizational Structure

The organizational structure to carry out the proposed program is illustrated in the diagram.



RELATIONSHIP TO OTHER PROGRAMS/PROJECTS

As previously stated, the ETCP will build upon the success of other Nicholls State University and HARC initiatives.

The U.S. Department of Energy (DoE), National Energy Technology Laboratory (NETL)/Tulsa sponsored a project (Contract P3NT30859) to develop a catalog template and technology readiness index methodology to assist with technology transfer. The purpose of the project was twofold. First, a preliminary catalog of a selection of accessible Navy-developed technologies that have value to the Gulf of Mexico offshore and supporting maritime operations was established. Second, a workshop was held with industry to solicit comments and

recommendations concerning expanding the catalog and/or establishing joint industry projects for the development and/or demonstration of these technologies. An overall goal of the project was to establish a methodology that identifies for the offshore energy and maritime industry applicable Navy environmental technologies for high value, high quality and low cost.

The ETCP will take advantage of the work performed under this program as well as others. The following is a selection of various other programs that are directly relevant to ETCP

- ***Environmentally friendly drilling systems:*** HARC has partnered with the Global Petroleum Research Institute (GPRI), Maurer Technology Inc., Anadarko Petroleum, and other industry sponsors to identify and develop environmentally friendly drilling systems incorporating current and new technologies. These new systems are being designed to be compatible with environmentally sensitive areas such as federal lands in the Western U.S. and the wetlands and marshes of the Gulf Coast. The goal is to integrate currently known but unproven or novel technologies into systems that will have very limited impact on environmentally sensitive areas.
- ***Offshore Norway:*** HARC was requested to join FMC Technology and Statoil in reviewing Statoil's subsea development practices with the objective of reducing the environment impact of drilling, completion and operation activities.
- ***Galveston Bay Estuary Program:*** HARC manages the status and trends (S&T) program. S&T involves compiling all of the databases related to the environmental health of the bay and evaluating their content. In a related project, HARC developed with assistance from important stakeholders a set of benchmark indicators of the health of the Bay.
- ***Coastal invasive species:*** The risk of ecological and economic damage from current and potential invading exotic species was assessed with the input of relevant regional experts.
- ***Urban forestry:*** HARC works on behalf of the Texas Forest Service to promote the benefits of forests in urban and ex-urban settings. Among other benefits, forests are sinks for carbon, and the planting and protection of forests is one of the available strategies for mitigation of greenhouse gas emissions.

LETTERS OF INTENT/SUPPORT

Letters of intent to collaborate have been obtained from HARC, SLEC and NAVSEA-Carderock. Letters of Support have been obtained from the two organizations that have been informed of this potential program, the Port of New Orleans and from Shaw Morgan City Terminal, Inc.

HARC

March 31, 2006

Dr. John Griffin
Nicholls State University
Thibodaux, LA 70310

Dear John,

Environmental Technology Collaboration Program

The Houston Advanced Research Center (HARC) would be pleased to continue our partnership with Nicholls State University through the proposed Environmental Technology Collaboration Program (ETCP). The ETCP will be a natural next step based on the success that we have had with the Shared Technology Transfer Program (STTP). The proposed program will support the protection and restoration of Louisiana coastal and wetland areas.

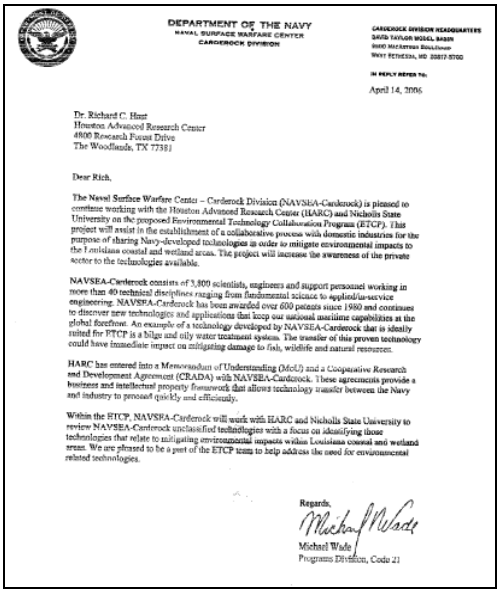
Through our efforts with NAVSEA-Carderock, there have been several technologies identified that could be applicable to the ETCP. The agreements that HARC has with NAVSEA-Carderock, a Memorandum of Understanding and a Cooperative Research and Development Agreement, provide a business and intellectual property framework that allows technology transfer between the Navy and industry to proceed quickly and efficiently. In addition to the technologies at NAVSEA-Carderock, we look forward to the possibility of expanding the program to include technologies from other government laboratories.

We are pleased to be a part of the ETCP team to help accelerate the transfer of environmental technologies to the offshore and maritime industries in order to mitigate damage to fish, wildlife and natural resources in South Louisiana.

Regards,

Jim Lester, Ph.D.
Environment Group Director

HARC Letter of Intent to Collaborate



DEPARTMENT OF THE NAVY
NAVAL SURFACE WARFARE CENTER
CARDEROCK DIVISION

CARDEROCK DIVISION HEADQUARTERS
DAVID TAYLOR MODEL BASIN
9500 MACARTHUR BOULEVARD
WEST BETHESDA, MD 20817-5700

IN REPLY REFER TO:

April 14, 2006

Dr. Richard C. Haut
Houston Advanced Research Center
4800 Research Forest Drive
The Woodlands, TX 77381

Dear Rich,

The Naval Surface Warfare Center – Carderock Division (NAVSEA-Carderock) is pleased to continue working with the Houston Advanced Research Center (HARC) and Nicholls State University on the proposed Environmental Technology Collaboration Program (ETCP). This project will assist in the establishment of a collaborative process with domestic industries for the purpose of sharing Navy-developed technologies in order to mitigate environmental impacts to the Louisiana coastal and wetland areas. The project will increase the awareness of the private sector to the technologies available.

NAVSEA-Carderock consists of 3,800 scientists, engineers and support personnel working in more than 40 technical disciplines ranging from fundamental science to applied/in-service engineering. NAVSEA-Carderock has been awarded over 600 patents since 1980 and continues to discover new technologies and applications that keep our national maritime capabilities at the global forefront. An example of a technology developed by NAVSEA-Carderock that is ideally suited for ETCP is a bilge and oily water treatment system. The transfer of this proven technology could have immediate impact on mitigating damage to fish, wildlife and natural resources.

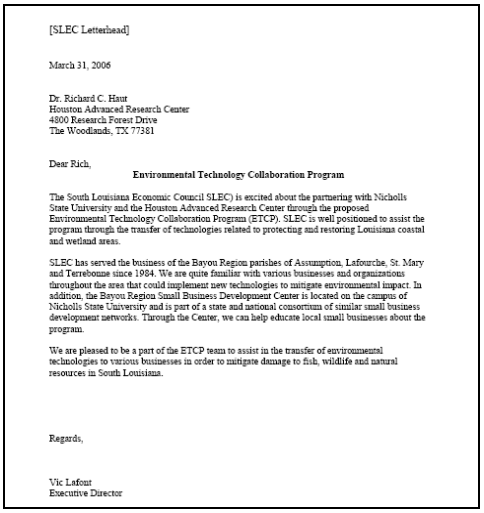
HARC has entered into a Memorandum of Understanding (MoU) and a Cooperative Research and Development Agreement (CRADA) with NAVSEA-Carderock. These agreements provide a business and intellectual property framework that allows technology transfer between the Navy and industry to proceed quickly and efficiently.

Within the ETCP, NAVSEA-Carderock will work with HARC and Nicholls State University to review NAVSEA-Carderock unclassified technologies with a focus on identifying those technologies that relate to mitigating environmental impacts within Louisiana coastal and wetland areas. We are pleased to be a part of the ETCP team to help address the need for environmental related technologies.

Regards,

Michael Wade
Programs Division, Code 21

NAVSEA Letter of Intent to Collaborate



[SLEC Letterhead]

March 31, 2006

Dr. Richard C. Haut
Houston Advanced Research Center
4800 Research Forest Drive
The Woodlands, TX 77381

Dear Rich,

Environmental Technology Collaboration Program

The South Louisiana Economic Council SLEC) is excited about the partnering with Nicholls State University and the Houston Advanced Research Center through the proposed Environmental Technology Collaboration Program (ETCP). SLEC is well positioned to assist the program through the transfer of technologies related to protecting and restoring Louisiana coastal and wetland areas.

SLEC has served the business of the Bayou Region parishes of Assumption, Lafourche, St. Mary and Terrebonne since 1984. We are quite familiar with various businesses and organizations throughout the area that could implement new technologies to mitigate environmental impact. In addition, the Bayou Region Small Business Development Center is located on the campus of Nicholls State University and is part of a state and national consortium of similar small business development networks. Through the Center, we can help educate local small businesses about the program.

We are pleased to be a part of the ETCP team to assist in the transfer of environmental technologies to various businesses in order to mitigate damage to fish, wildlife and natural resources in South Louisiana.

Regards,

Vic Lafont
Executive Director

SLEC Letter of Intent to Collaborate

PORT OF NEW ORLEANS

April 10, 2006

Dr. Richard C. Haut
Houston Advanced Research Center
4800 Research Forest Drive
The Woodlands, TX 77381

RE: Environmental Technology Collaboration Program

Dear Rich,

Thank-you for sharing with us the information about the new initiative that Nicholls State University, the Houston Advanced Research Center and the South Louisiana Economic Council are pursuing to mitigate environmental impacts to the Louisiana coastal and wetland areas. The proposed Environmental Technology Collaboration Program (ETCP) is definitely needed in our area and the Port of New Orleans is interested in various technologies that we discussed.

In particular, the Port of New Orleans is interested in the bilge and oily waste water treatment technologies that have been developed by NAVSEA-Carderock. Through the ETCP program, we would like to explore the possibility of applying this technology to our operations. This technology could mitigate damage to fish, wildlife and natural resources in the Louisiana coastal and wetland areas.

The ETCP program that you have outlined is well thought out and could greatly assist with the protection and restoration of our coastal area. We strongly support the initiative and definitely believe that the Coastal Impact Assistance Program should fund your effort.

Sincerely,

Catherine C. Dunn, P.E.
Deputy Director, Port Development

CCD:jeg

Port of New Orleans Letter of Support

Shaw Shaw Morgan City Terminal, Inc.

Shaw Morgan City Terminal, Inc.
800 Youngs Road
Morgan City, Louisiana 70381
985-384-0860
FAX: 985-385-1021

April 10, 2006

Dr. Richard C. Haut
Houston Advanced Research Center
4800 Research Forest Drive
The Woodlands, TX 77381

Dear Rich,

Environmental Technology Collaboration Program

I want to thank you for sharing the information about the Environmental Technology Collaboration Program (ETCP), the new initiative that Nicholls State University, the Houston Advanced Research Center and the South Louisiana Economic Council are pursuing to mitigate environmental impacts to the Louisiana coastal and wetland areas. The proposed ETCP would greatly assist our efforts and we are interested in various technologies that were discussed.

NAVSEA-Carderock has many technologies that could be applicable to our core business that are related to reducing environmental impacts and we would like to explore the possibility of applying these technologies to our operations. The proposed ETCP could mitigate damage to fish, wildlife and natural resources in the Louisiana coastal and wetland areas.

The ETCP program would be a great way to accelerate the transfer of environmental technologies that could assist with the protection and restoration of our coastal area. We strongly support the initiative and definitely support funding for your effort from the Coastal Impact Assistance Program.

Regards,

Robert P. Richard
Consultant

Shaw Letter of Support

DESCRIPTION OF ENVIRONMENTAL IMPACTS

The technology outreach element of the proposed Environmental Technology Collaboration Program (ETCP) will identify various technology transfer projects that are aimed at mitigating environmental impact and damage to fish, wildlife and natural resources. These individual technology transfer projects will involve a specific business partner. As technology transfer projects are identified and developed, the ETCP team will work with specific business partners to perform technical assessments of the environmental risks associated with the demonstration of the technologies.

REGULATORY STATUS AND CONSISTENCY WITH STATE COASTAL ZONE MANAGEMENT PROGRAM

The technology outreach element of the proposed Environmental Technology Collaboration Program (ETCP) will identify various technology transfer projects that may require Federal, State or local permits. These individual technology transfer projects will involve a specific business partner. As technology transfer projects are identified and developed, the ETCP team will work with the specific business partner to ensure that the applicable permits are obtained.

RELATIONSHIP TO OTHER FEDERAL PROGRAMS

Nicholls State University has been working with the Houston Advanced Research Center (HARC) to implement the Shared Technology Transfer Program (STTP) aimed at identifying and transferring technology from NAVSEA-Carderock to the offshore and maritime industries.

The STTP was created in response to the growing demand for new, environmentally intelligent technology for the offshore and maritime industry. The current program has identified potential technologies for transfer and demonstration, based on Navy technology that is applicable to the needs of the offshore, energy and maritime industries. Core activities encompass:

- Reviewing and cataloging available NAVSEA-Carderock technologies
- Mapping industry needs to the technologies
- Assessing technology transfer and demonstration plans
- Facilitating the effective technology transfer and demonstration of identified technologies
- Serving as a clearinghouse for information and education about the Program/ providing useful industry contacts throughout the entire supply chain.

The U.S. Department of Energy – Office of Fossil Energy funded an initial project that outlined a web based technology catalog providing information about technical resources. Recognizing the transition to hydrogen, the Department of Energy funded the STTP to educate the industry. Federal funding of the STTP will expire in August 2006.

With CIAP funding, the ETCP will reach a broader audience and address the significant need that has been identified for environmental technologies in Southern Louisiana.

ESTIMATED PROJECT COST BREAKDOWN

Four Year Program

BUDGET CATEGORIES			
Category	**Technology Outreach Element**	**Technology Transfer Element**	**Total**
Personnel	$ 589,788	$ 884,680	$ 1,474,468
Fringe Benefits	$ 110,212	$ 165,320	$ 275,532
Travel	$ 60,000	$ 90,000	$ 150,000
Equipment			
Supplies	$ 40,000	$ 60,000	$ 100,000
Contractual	$ 2,216,000	$ 5,784,000	$ 8,000,000
Construction			
Other			
Total Direct Charges			
Indirect Charges			
TOTALS	**$ 3,016,000**	**$ 6,984,000**	**$ 10,000,000**

Notes

Technology Outreach Element – Contractual

Houston Advanced Research Center/NAVSEA-Carderock: $ 1,300,000
South Louisiana Economic Council: $ 916,000

Technology Transfer Element – Contractual

Houston Advanced Research Center/NAVSEA-Carderock: $ 4,984,000
South Louisiana Economic Council: $ 800,000

The Houston Advanced Research Center will manage the NAVSEA-Carderock contract through an existing Cooperative Research and Development Agreement (CRADA). As Technology Transfer projects are identified and implemented, HARC may manage other subcontracts as needed.

The estimated budget is $2,500,000 per year, split between the technology outreach element and the technology transfer element. It is expected that there will be between two and four technology transfer projects per year at a cost of $250,000 to $750,000 per project.